



# Highway Safety Literature

... A SEMI-MONTHLY ABSTRACT JOURNAL

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Journal articles should be obtained from the publisher.

Material directly related to Highway and/or Motor Vehicle Safety is solicited for inclusion in Highway Safety Literature. Topics must fall within the scope of the Subject Fields and Groups listed on the inside front cover. Submit material, together with a written statement of approval for publication to:

Office of Administrative Services (N48-50)

National Highway Traffic

Safety Administration

400 7th Street, S.W.

Washington, D.C. 20590

Documents containing several articles are announced as a complete volume in the last column. Individual articles are listed in their most specific category.

### SAMPLE ENTRIES

Subject Categories		HS-800 218 Fld. 5/21; 5/9	HS-004 497 Fld. 5/19
NHTSA Accession No.			
Title of document		AN INVESTIGATION OF USED CAR SAFETY STANDARDS—SAFETY INDEX: FINAL REPORT. VOL. 6 — APPENDICES G-L	AUTO THEFT —THE PROBLEM AND THE CHALLENGE
Personal author(s)		by E. N. Wells; J. P. Fitzmaurice; C. E. Guilliams; S. R. Kalin; P. D. Williams	by Thomas A. Williams, Sr.
Corporate author		Operations Research, Inc.	
Pagination			
Publication date		1969 150p Contract FH-11-6921 Report no. ORI-TR-553-Vol. 6; PB-190 523	Published in <i>FBI Law Enforcement Bulletin</i> v37 n12 p15-7 (Dec. 1968)
Abstract		Appendices G-L to this study of used car safety standards include: indenture model diagrams for classes I-IV motor trucks; degradation, wear, and failure data for motor truck classes I-IV; and safety index tables for classes I-IV motor trucks. Search terms; Wear; Trucks; Failures; Used cars; Inspection standards	Gives figures on the extent of the auto theft problem and comments on anti theft devices available now or in the planning stage.  Search terms: Theft; Theft protection; Stolen cars  (Note: If the date of a report or journal article is not given, the small letters <u>and</u> will appear)
Availability		NTIS	

NOTE: ( ) Numbers in parentheses following certain subject groups indicate the Highway Safety Program Standards (No. 1 and up) and/or Federal Motor Vehicle Safety Standards (No. 101 and up) which may apply to these groups.

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## 5/0 VEHICLE SAFETY . . . . .

\*All Federal Motor Vehicle Safety Standards apply to passenger vehicles. An asterisk before a subject group indicates additional types of vehicles to which the indicated standard may apply.

- \*1 Brake Systems (102, 105, G, 116)
- \*2 Buses, School Buses, and Multipurpose Passenger Vehicles (102-4, 106-8, 111-3, 116, 209-6, 209, 210)
- \*3 Cycles (3; 108, 112, 116, 205)
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- /6 Fuel Systems (101, 301)
- /7 Glazing Materials (205)
- /8 Hood Latch Systems (113)
- /9 Inspection (1)
- /10 Lighting Systems (101, 105, 108, 112)
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- /13 Mirrors and Mountings (107, 111)
- /14 Occupant Protection (16; 201-4, 202-10)

# 1/0 ACCIDENTS

## 1/1 Emergency Services

HS-012 244 Fld. 1/1

### HOW DETROIT HANDLES EMERGENCIES

by G. M. Griffin

Published in *Traffic Safety* v72 n11  
p22-5, 39-40 (Nov 1972)

1972

Detroit's emergency medical service division now is a separate division within the Detroit Fire Department. Previously emergency medical services were carried out by the police department and a special unit of the fire department, yet in neither department was this a primary responsibility. The new division's personnel, services, and equipment are described. The new division exclusively dedicated to the handling of emergency patients, not only provides better treatment for the victim but also it enables the fire and police departments to provide better services.

Search terms: Emergency medical services; Detroit; Ambulance personnel; Ambulance design; First aid equipment

## 1/3 Investigation

HS-012 209 Fld. 1/3; 5/20

RAILROAD/HIGHWAY ACCIDENT REPORT. ATCHISON, TOPEKA AND SANTA FE PASSENGER TRAIN NO. 212 COLLISION WITH STILLWATER MILLING COMPANY MOTOR TRUCK AT 116TH STREET NORTH GRADE CROSSING

1972 44p

Report no. NTSB-RHR-72-1; SS-R/H-4

The truck struck the second diesel unit. The first chair car and the remaining cars of the passenger train were derailed; one rail car overturned. Railroad employees and passengers in the train were injured. Two passengers on the train were killed, as was the driver of the truck, and 21 passengers were injured. The probable cause of the accident was the failure of the driver to stop his truck prior to impact with the passenger train, while crossing warning signals were indicating the approach of the train. The driver misperceived the hazard presented by the approaching train. The causes of the fatalities and the injuries are attributed to the speed of the vehicles at impact, separation and excursion of the train from the right-of-way, overturn of the rail passenger car, and inadequate crash-worthiness of the rail passenger coach and the truck. The report suggests improvements in grade crossing controls, equipment design, and emergency communications procedures.

Search terms: Railroad grade crossing accidents; Vehicle train collisions; Accident investigation; Accident analysis; Accident case reports; Truck accidents; Driver fatalities; Passenger fatalities; Passenger injuries; Crash-worthiness; Injury causes; Driver error caused accidents; Accident factors; Accident location; Property damage accidents; Environmental factors; Accident causes; Oklahoma; Warning system effectiveness; Hazard perception; Accident reconstruction

HS-012 210 Fld. 1/3; 5/20

RAILROAD/HIGHWAY ACCIDENT REPORT. ILLINOIS CENTRAL RAILROAD COMPANY TRAIN NO. 1 COLLISION WITH GASOLINE TANK TRUCK AT SOUTH SECOND STREET

1971 34p

Report no. NTSB-RHR-1; SS-R/H-5

The tank of the truck was split open, spilling the gasoline which exploded and caught fire. The burning gasoline covered the exterior of the locomotive unit and entered the control compartment through the nose door, damaged nose, and other openings. Three employees of the railroad and the driver of the truck received fatal injuries from the burning gasoline. The probable cause of this accident was that the operator drove the gasoline-laden truck, without stopping, onto the tracks immediately in front of the approaching train, while the crossing warning device was indicating the train's approach.

Search terms: Vehicle train collisions; Accident case reports; Railroad grade crossing accidents; Illinois; Fatalities; Accident analysis; Tank trucks; Truck accidents; Driver error caused accidents; Accident caused fires; Property damage accidents; Accident causes; Accident factors; Environmental factors; Hazard perception; Vehicle explosions; Warning system effectiveness

AVAILABILITY: NTIS

HS-012 211 Fld. 1/3; 5/20

HIGHWAY ACCIDENT REPORT. TRUCK-AUTOMOBILE COLLISION INVOLVING SPILLED METHYL BROMIDE ON U. S. 90 NEAR GRETN, FLORIDA, AUGUST 8, 1971

National Transp. Safety Board, N30000

1972 58p

Report no. NTSB-HAR-72-3; SS-H-15

An automobile making a left turn at an intersection was struck by a tractor-van

unsecured large steel cylinders, containing a mixture of methyl bromide and chlorpicrin pressurized with air, broke out of the trailer and sustained damages which resulted in leakage of the contents. Four of the automobile occupants exposed to the resultant contaminated atmosphere did not survive. The National Transportation Safety Board determined that the cause of this accident was the passing maneuver of the truckdriver and the execution without signaling of a left turn by the automobile driver into the path of the overtaking truck. The probable cause of the fatalities was the prolonged exposure of the disabled occupants of the automobile to high concentrations of the poison chemical mixture which escaped from damaged containers. Applicable federal regulations are included.

Search terms: Vehicle vehicle collisions; Accident case reports; Accident investigation; Accident analysis; Florida; Truck accidents; Tractor semitrailers; Fatalities; Injuries; Fatality causes; Passing; Hazardous materials; Poisoning; Leakage; Accident factors; Emergency services; Compressed gases; Left turns; Accident causes; Transportation of hazardous materials; Regulations; Damage

HS-012 212 Flid. 1/3

**HIGHWAY ACCIDENT REPORT. MULTIPLE-V EHICLE COLLISIONS AND FIRES, U. S. 101 NORTH OF VENTURA, CALIFORNIA, AUGUST 18, 1971**

National Transp. Safety Board, N30000

1972 44p  
Report no. NTSB-IAR-72-4

A number of cars and trucks accumulated in both southbound lanes of

limit and crashed into the stopped vehicles, crushing them together; fires erupted and eight persons were killed in the crashes and fires. The National Transportation Safety Board determined that the probable cause of this series of collisions was the stopping of a vehicle in an unsafe position in a traffic lane, which impeded traffic flow, and the failure of a tractor semitrailer, moving at posted speed, to reduce its speed sufficiently to avoid collision with stopped and slow-moving vehicles ahead. All eight fatalities were caused by impact trauma, contributed to by the inhalation of super-heated toxic gases from the fires.

Search terms: Accident case reports; Accident analysis; Accident investigation; California; Multiple vehicle accidents; Accident caused fires; Vehicle fires; Fatalities; Fatality causes; Rear end collisions; Injuries; Accident location; Damage; Precrash phase; Crash phase; Postcrash phase; Accident factors; Disabled vehicles; Accident causes; Truck accidents; Debris removal; Occupant kinematics; Door system failures; High speed caused accidents

HS-012 213 Flid. 1/3; 5/20

**HIGHWAY ACCIDENT REPORT. LIQUEFIED OXYGEN TANK TRUCK EXPLOSION FOLLOWED BY FIRES IN BROOKLYN, NEW YORK, MAY 30, 1970**

National Transp. Board, N30000

1971 64p  
Report no. NTSB-HAR-71-6; SS-H-8

A tank truck partially filled with liquefied oxygen exploded, without warning. The force of the explosion and ensuing fires resulted in fatal injuries to the

out warning, during conditions normally incident to transportation, of one or more reactant materials inside the cargo tank, which triggered an intense heat-producing reaction between the aluminum of the cargo tank and the oxygen cargo; the resultant rapid rise in pressure and weakening of the tank wall led to the explosive rupture of the tank and the resultant fatalities, injuries, and property damage. Contributory hazards were found to be reactive foreign matter inside the tank, configurations of certain components, a material of construction which can react vigorously with the cargo, and absence of effective contamination monitoring processes.

Search terms: Accident case reports; Accident investigation; Accident analysis; Vehicle explosions; Tank trucks; Hazardous materials; Liquid oxygen; New York City; Chemical reactions; Truck safety standards; Regulations; Damage; Accident reconstruction; Oxidation; Truck accidents; Accident causes; Accident factors; Aluminum; Transportation of hazardous materials

**AVAILABILITY: NTIS**

HS-012 214 Flid. 1/3

**HIGHWAY ACCIDENT REPORT. ACCIDENTAL MIXING OF INCOMPATIBLE CHEMICALS, FOLLOWED BY MULTIPLE FATALITIES, DURING A BULK DELIVERY, BERWICK, MAINE, APRIL 2, 1971**

National Transp. Safety Board, N30000

1971 13p  
Report no. NTSB-HAR-71-7; SS-H-13

Six tannery workers died from inhalation of a toxic gas formed by the

the tank semitrailer had been connected to the wrong plant fill line connection. A need to identify risks existing at bulk delivery transportation/receiving interfaces was established, and an investigation recommended. The National Transportation Safety Board determined that the cause of this accident was the failure of the carrier's drivers and the tannery foreman to establish an error-free exchange of information required to accomplish the safe transfer of the cargo from the vehicle into a plant storage tank. The likelihood of this failure was increased by the absence of instructions or training in information validation procedures to be followed during such exchanges, and by the absence of markings, devices or other measures on the vehicle or tannery property which would have permitted such validation to be made unilaterally by either party.

Search terms: Maine; Accident case reports; Accident analysis; Accident investigation; Chemical reactions; Hazardous materials; Tank trucks; Fatalities; Interpersonal communications; Accident causes; Accident factors; Regulations; Poisoning; Sodium hydrosulfide; Hydrogen sulfide; Curing agents

**AVAILABILITY: NTIS**

**HS-012 215** Fld. 1/3; 5/2

**HIGHWAY ACCIDENT REPORT. CHARTERED BUS CRASH ON U.S. ROUTE 22 (INTERSTATE 78), NEAR NEW SMITHVILLE, PENNSYLVANIA, JULY 15, 1970**

National Transp. Safety Board, N30000

1971 68p

Report no. NTSB-HAR-71-8; SS-H-10

While traveling about 55 mph on a slight curve to the right, a chartered bus traversed a section of highway where

the bus skidded clockwise 180° and into the cable-type guardrail, which failed to hold the bus, permitting it to roll down a steep embankment with a 30 foot drop. In the crash, 18 occupants were ejected, resulting in death to seven students and varying injuries to some 47 other occupants. The probable cause of this accident was hydroplaning of the front wheels of the bus which initiated a skid from which the driver could not recover. Contributing factors included low basic skid resistance of the pavement in wet weather and the probable presence of water draining across the pavement in an abnormal manner. The fatalities and injuries were caused by an ineffective highway guardrail, by bus windows which failed to prevent ejection of some passengers, and in some cases, by the absence of occupant restraints.

Search terms: Bus accidents; Accident case reports; Accident analysis; Accident investigation; Loss of control caused accidents; Hydroplaning; Wet road conditions; Skidding accidents; Pavement skid resistance; Driver physical fitness; Guardrails; Vehicle kinematics; Tire wear; Occupant kinematics; Highway characteristics; Accident location; Damage; Drainage; Bus design; Driver records; Ejection; Fatality causes; Injury causes; Accident factors; Pennsylvania

**AVAILABILITY: NTIS \$3.00**

**HS-012 225** Fld. 1/3; 4/0

**LONG-TERM RETENTION OF SAFETY PROCEDURES LEARNED THROUGH ACCIDENT SIMULATION**

by N. F. Smith; S. Rubinsky

Rhode Island Univ., R09600

Report no. RRL-RR-70-12, DREW (HSM)-72-10016

Eighty college students were subjected to simulated accidents on a modified bench grinder to test the long-term effectiveness of accident simulation as a technique for teaching safe operating procedures on small power tools. Half the subjects in each group received the simulated accidents on consecutive trials during the 15 training session trials, while the other half received the same number of simulated accidents intermittently throughout the training session. The results showed that six months after the single training session all groups trained with the use of simulated accidents had significantly fewer accidents than the control groups given traditional safety training. Neither the number of simulated accidents nor the method of presentation made a significant difference in the number of accidents. It is concluded that accident simulation is a promising technique for teaching safe operating procedures on small power tools.

Search terms: Accident simulation; Safety education; Accident prevention; Variance analysis; Industrial accidents

**AVAILABILITY: GPO**

**HS-012 226** Fld. 1/3; 5/20

**MOTOR CARRIER ACCIDENT INVESTIGATION. QUINN FREIGHT LINES, INC. ACCIDENT—AUGUST 6, 1971—SHREWSBURY, MASSACHUSETTS**

Bureau of Motor Carrier Safety, B32400

1972? 12p

Report no. 71-6

An eastbound truck ran off the right side of the road, collided with a parked car

## 1/3 Investigation (Cont'd.)

### HS-012 226 (Cont'd.)

on the shoulder, and struck a police officer standing near the left side of the car. Upon impact the car was shoved a distance of 62 feet, and its driver was ejected. The struck police officer was thrown 91 feet from the initial point of collision. The truck veered sharply to the right, continued its forward motion for 156 feet and ran through a house. As a result of the accident the injured police officer died in route to the hospital. The two occupants of the house, the driver of the truck, and the driver of the car were injured. Property damage was estimated at \$14,000. It was concluded that the accident was caused by driver failure. The truck driver was apparently fatigued and dozing at the wheel.

Search terms: Accident case reports; Accident investigation; Tractor semitrailers; Truck accidents; Rear end collisions; Property damage accidents; Driver fatigue caused accidents; Vehicle pedestrian collisions; Vehicle vehicle collisions

## 1/5 Statistical data

### HS-012 216 Fld. 1/5

#### WASHINGTON STATE TRAFFIC ACCIDENT FACTS 1971

Washington State Patrol, W04500

1972 3p

Statistics are given on types of motor vehicle accidents, traffic accidents by location, principal classes of motor vehicle deaths, motor vehicle accidents by county, registration death rate by county, highway deaths and fatalities,

tions, bicycle study, seat-belt study, vehicle information, motorcycle accident facts, pedestrian information, directional analysis, road surface and light conditions, miscellaneous actions, traffic trends, motor vehicle traffic accidents and related data 1937-71, holiday deaths, and additional facts of interest.

Search terms: Accident statistics; Fatality rates; Injury statistics; Accident types; Accident location; Rural accidents; Urban accidents; Day of week; Month; Age factor in accidents; Fatalities by age; Accident rates; Time of accidents; Driver characteristics; Driver error caused accidents; Accidents by body type; Pedestrian accidents; Injuries by age; Accident causes; Bicycle accidents; Seat belt usage; Accidents by vehicle condition; Pedestrian fatalities; Pedestrian injuries; Motorcycle accidents; Holidays; Road conditions; Light conditions; Drinking drivers; Washington

### HS-012 221 Fld. 1/5; 5/2

#### 3-YEAR SUMMARY OF TRAFFIC ACCIDENTS INVOLVING SCHOOL BUSES, 1969-1972 SCHOOL YEARS

Washington State Patrol, W04500

1973? 8p

Statistics are tabulated for accident types, month of year, directional analysis, pedestrian accidents, age and sex of school bus drivers, age of persons killed or injured, type of vehicle, school bus defects, driver violations, time of accidents, and road surface conditions.

Search terms: School bus accidents; School bus drivers; Accident statistics; Accident types; Month; Fatalities by

accidents; Traffic law violations; Day of week

### HS-012 222 Fld. 1/5; 3/11

#### SUMMARY OF PEDESTRIAN TRAFFIC ACCIDENTS 1971

Washington State Patrol, W04500

1972? 12p

Statistics are tabulated for fatalities and injuries, month of year, age of pedestrians, pedestrian violations, location in street, accidents by county, driver condition, weather conditions, light and road surface conditions, time of accidents, and urban and rural accidents.

Search terms: Washington; Pedestrian accidents; Pedestrian age; Pedestrian behavior; Pedestrian fatalities; Pedestrian injuries; Urban accidents; Rural accidents; Day of week; Road conditions; Light conditions; Accident statistics; Vehicle pedestrian collisions; Accident rates; Month; Fatalities by age; Injuries by age; Drinking drivers; Weather; Time of accidents

### HS-012 223 Fld. 1/5; 5/20

#### HEAVY TRUCK ACCIDENT STUDY 1971

Washington State Patrol, W04500

1972? 9p

Statistics are tabulated for accident types, rural vs. urban, types of roadway, type of truck, driver residence, road surface conditions, accident location, driver occupations, driver age, driver sobriety, day of week, light conditions, time of day, driver violations, vehicle defects, and accidents by county.

drivers; Driver intoxication; Day of week; Light conditions; Fatalities; Accident statistics; Injury statistics; Driver residence; Rural accidents; Urban accidents; Driver occupation; Driver age; Time of accidents; Accident causes; Traffic law violations; Washington (State)

HS-012 224 Fld. 1/5

## CAR-TRAIN ACCIDENT STUDY 1971

Washington State Patrol, W04500

1972? 7p

Statistics are tabulated for urban and rural accidents; type of vehicle involved; road surface condition; driver age, sex, residence, and sobriety; light and weather conditions; driver violations; day of week; month of year; and accidents by county.

Search terms: Vehicle train collisions; Light conditions; Road conditions; Driver age; Driver sex; Drinking drivers; Driver intoxication; Weather; Month; Day of week; Driver error caused accidents; Fatalities; Injury statistics; Accident statistics; Accident causes; Urban accidents; Rural accidents; Driver residence; Traffic law violations; Time of accidents; Accident location; Railroad grade crossing accidents; Washington (State)

HS-012 238 Fld. 1/5; 1/3

## HOLIDAY PORTRAIT—1969

California State Automobile Assoc., CI2500; Automobile Club of Southern California, A79400

which occurred in California over the five long holiday weekends in 1968 and 1969. In the combined two-year study, there were 255 fatal accidents in which 301 persons were killed. The last, or returning home days did not show a greater number of fatalities than any other full day over the weekends. In most cases, the majority of accidents occurred during the middle days of the periods, and analysis indicated that most of the motorists and pedestrians were engaging in activities common to any weekend. Detailed accident statistics are presented for each holiday as well as a synopsis for each fatal accident occurring during the holidays. Descriptions of the 10 worst driving records of 1968 and 1969 are included.

Search terms: Accident statistics; Accident studies; Fatalities by age; Holidays; Time of accidents; Accident causes; California; Accident rates; Traffic law violations; Failure caused accidents; Urban accidents; Rural accidents; Accidents by vehicle make; Trip purpose; Fatalities by sex; Seat belt usage; Accident factors; Drinking drivers; Accidents by vehicle size; Problem drivers; Driver records; Accident types; Motorcycle accidents; Highway characteristics; Pedestrian accidents; Age factor in accidents

## 2/0 HIGHWAY SAFETY

### 2/4 Design and Construction

HS-012 196 Fld. 2/4; 4/4; 4/2

## PROBLEMS IN IMPLEMENTING THE HIGHWAY SAFETY IMPROVEMENT PROGRAM

General Accounting Office, G02100

1972 47p

Overview, Committee on Public Works.

The highway safety improvement program established to identify and correct hazards on federal aid highways was reviewed. The review was performed in Colorado, Illinois, Missouri, Montana, Oregon, and Utah. Eight years after inception, the highway safety improvement program has yet to become a fully implemented major national program. The highway safety improvement program is dependent upon routinely setting aside and using funds specifically to eliminate highway hazards, identifying hazardous locations on the basis of actual accident experience, and correcting hazards in accordance with priorities based on potential for accident reduction in relation to the cost of the correction. Legislative action specifically setting aside a part of highway trust funds to ensure an appropriate level of accomplishment would provide a more effective program incentive.

Search terms: Highway safety programs; Program evaluation; Highway improvements; Compliance; Highway accident potential; Financing; Benefit cost analysis; Safety program effectiveness; Accident location; Federal state relationships; Federal aid; Federal role; Colorado; Illinois; Missouri; Montana; Oregon; Utah; Roadside hazards; Priorities

HS-012 201 Fld. 2/4

## LITERATURE REFERENCES ON TECHNIQUES FOR THE EVALUATION OF FACTORS RELEVANT TO DECISION MAKING ON HIGHWAY LOCATIONS

by E. C. Carter; L. E. Haefner; J. W. Hall

Maryland Univ., M11400



## 2/4 Design and Construction (Cont'd.)

### HS-012 201 (Cont'd.)

factors; visual techniques; numerical techniques; engineering-economic techniques; combination techniques; cost-effectiveness, systems analysis and program budgeting techniques; general methodology; general background references; citizen participation and community decisions, joint development, and multiple use of rights-of-way; legislative acts, executive orders, and instructional and policy and procedure memoranda.

Search terms: Highway location; Highway planning; Highway design; Highway engineering; Highway economic factors; Highway environmental impact; Sociological factors; Decision making; Bibliographies; Surveying; Benefit cost analysis; Right of way (land); Systems analysis; Community support; Land multiple usage; Numerical analysis; Economic analysis; Program evaluation; Value analysis

accident prevention programs that incorporate minimum skid resistance levels and wet-weather speed limits.

Search terms: Pavement skid resistance; Friction studies; Wet skidding; Tire skid resistance; Pavement friction; Wet road conditions; Passing; Tire pavement interface; Mathematical analysis; Motion pictures; Pavement skidding characteristics; Speed limits

This might include changes in the gear mounting, addition of isolation, or structural changes to the system in which the gears are operating.

Search terms: Noise control; Gears; Acoustic measurement; Vibration; Gear teeth; Displacement; Gear design

### AVAILABILITY: SAE

## 2/7 Meterological Conditions

### HS-012 200 Fld. 2/7

## BEVEL AND HYPOID GEAR NOISE REDUCTION

by L. S. Pitts

Gleason Works, G21600

1972 7p 5refs  
Report no. SAE-720734

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

Gear noise originates at the meshing action of the tooth surface due to the localization or mismatch of these tooth surfaces introduced for practical operating considerations. Efforts to reduce gear noise at its source are limited by the practical consideration created by mounting displacement. Proper identification of gear mesh noise is very important as improper identification may lead to corrective measures in the wrong area. As overall product noise is reduced, discrete frequencies such as

### HS-012 249 Fld. 2/7; 3/8

## A BALANCED APPROACH TO NOISE ABATEMENT

by T. C. Young

Published in *Journal of Automotive Engineering* v80 n9 p38-42 (Sep 1972)

1972

The noise problem is described, especially the noise caused by vehicles and recreational equipment. Noise tolerances and standards and the costs of noise control are discussed. Automotive product designers should try to reduce noise to the point where adverse health effects are eliminated, but a proper technological and economic base is needed for noise control.

Search terms: Noise control; Noise standards; Acoustic measurement; Vehicle noise; Noise control costs; Noise sources; Noise tolerances; Health hazards

### HS-012 251 Fld. 2/4; 5/22

## THE FRICTIONAL REQUIREMENTS OF PASSING VEHICLES

by J. C. Glennon

Published in *Highway Research Record* n396 p21-32 (1972)

1972 2refs

Sponsored by the Highway Res. Board Com. on Surface Properties-Vehicle Interaction.

## 2/9 Traffic Control

Supported by the California Office of Traf. Safety and the National Hwy. Traf. Safety Administration.

The objectives of the study were an overall review of major traffic circulation patterns and facilities in Davis, Calif., identification of deficiencies and problem areas, and conceptualization of alternatives to improve circulation and safety. Specific problem areas identified for detailed emphasis included a railroad grade separation, an interstate interchange, linkage of the university perimeter road to the city street system, downtown area circulation, and east-west city circulation needs.

Search terms: Program evaluation; Traffic volume; Traffic density; Intersection collisions; Highway design; Railroad grade crossings; One way streets; Malls; California; Accident location; Accident rates; Underpasses; Transportation planning; Travel patterns; Peak hour traffic; Trip forecasting; Highway improvements; Accident scale drawings; Transportation system costs; Central business districts; Commuting patterns; Parking; Accident prevention; Overpasses

### 3/0 HUMAN FACTORS

#### 3/1 Alcohol

HS-800 537 Fld. 3/1

#### BASIC TRAINING PROGRAM FOR BREATH EXAMINER SPECIALIST. COURSE GUIDE

by A. Hale; A. Clevon

Dunlap and Associates, Inc., D31800

1971 31p 26refs

suggestions for course planning including scheduling of lessons, class size, prerequisites for students and instructors, training facilities, and instructor and student reference materials; guidelines for conducting the course; and recommendations for measuring student achievement. The course has been designed so that each student will conduct approximately 50 tests on the precision breath equipment. In addition to equipment practice, students practice giving testimony in a mock court and completing forms relative to suspect processing.

Search terms: Alcohol breath tests; Police training; Drinking driver evidence; Curricula

AVAILABILITY: GPO \$0.60

HS-800 538 Fld. 3/1

#### BASIC TRAINING PROGRAM FOR BREATH EXAMINER SPECIALIST. STUDENT STUDY GUIDE

by A. Hale; A. Clevon

Dunlap and Associates, Inc., D31800

1971 75p 26refs  
Contract FH-11-7540

This guide is designed to serve as a basic reference text to reinforce and supplement class material. It includes a summarization of materials presented in the course: basic scientific concepts, the physiology of alcohol, relevant sections of the Uniform Vehicle Code, court procedure, and breath testing procedure.

Search terms: Instruction manuals; Alcohol breath tests; Alcohol effects; Alcohol laws; Uniform Vehicle Code; Blood alcohol levels; Police training; Driver prosecution; Drinking driver

HS-800 539 Fld. 3/1

#### BASIC TRAINING PROGRAM FOR BREATH EXAMINER SPECIALIST. INSTRUCTOR'S LESSON PLANS

by A. Hale; A. Clevon

Dunlap and Associates, Inc., D31800

1971 333p 26refs  
Contract FH-11-7540

This document has been prepared to aid the instructor in conducting a basic training course for the breath examiner specialist, who is normally a policeman. It contains detailed lesson plans for the course, guidelines for developing written test materials, hints for effective teaching, and recommended student work forms for specific lessons. Seventeen basic lesson plans have been developed for the course. They are categorized into the three groups as follows: course background, suspect processing, and court testimony; breath equipment theory, operation, and laboratory; and review and evaluation.

Search terms: Curricula; Alcohol breath tests; Police training; Instruction materials; Drinking driver evidence; Arrest procedures; Testimony; Driver prosecution; Alcohol laws

AVAILABILITY: GPO \$3.00

#### 3/2 Anthropomorphic Data

HS-800 727 Fld. 3/2

#### DUMMY HEAD MECHANICAL IMPEDANCE TESTS. FINAL REPORT

by R. L. Stalnaker; J. H. McElhancy

Michigan Univ. Hwy. Safety Res. Inst., M40800

## **3/2 Anthropomorphic Data (Cont'd.)**

### **HS-800 727 (Cont'd.)**

The purpose of this testing program was to determine the mechanical impedance characteristics of a number of developmental dummy heads and to correlate the data with existing mechanical impedance data for human cadaver heads. Four dummy heads were mounted on an electromagnetic shaker and properly instrumented to obtain the following information over a frequency range of 30-5000 Hz: driving point impedance (DPI) and acceleration at the forehead, side of the head, and back of the head; transfer point impedance and acceleration at the center of gravity of the head and at a point on the skull, opposite the driving point. The mechanical impedance and acceleration were recorded at 11 locations on each head. The DPI of each dummy head in each direction was compared to the DPI of fresh unembalmed cadavers tested in a similar manner.

Search terms: Anthropomorphic dummies; Head forms; Mechanical impedance; Accelerometers; Cadavers in testing; Center of gravity; Damping; Head acceleration tolerances; Resonant frequency; Stiffness; Mass; Human body mechanical impedance; Mathematical analysis

**AVAILABILITY: NTIS**

### **3/3 Cyclists**

**HS-012 218 Fld. 3/3; 5/3; 3/11**

## **PEDESTRIAN AND BICYCLE SAFETY. PLEASANTON**

DeLeuw, Cather and Co., D06000

1972 88p

The study included analysis of pedestrian and bicycle records; evaluation and determination of deficiencies related to marked crosswalks; coordination of the preparation of safe route maps; development of an informational pamphlet for distribution to the general public; evaluation of pedestrian and bicycle safety; and suggested guidelines for the continuing program.

Search terms: Bicycle safety; Bicycle accidents; Pedestrian safety; Pedestrian accidents; Pedestrian education; Child safety education; Age factor in accidents; Sex factor in accidents; Crosswalks; California; Safety programs; Program evaluation; Accident severity; Accident responsibility; Audiovisual aids; School crossing protection; Month; Day of week; Time of accidents; Statistical analysis; Maps

**HS-012 220 Fld. 3/3**

## **BICYCLE CIRCULATION AND SAFETY STUDY. CITY OF DAVIS. UNIVERSITY OF CALI- FORNIA**

De Leuw, Cather and Co., D06000

1972 108p 15refs

Supported by the California Office of Traf. Safety and the National Hwy. Traf. Safety Administration.

Objectives of the study were to evaluate the Davis, Calif., cycleway system performance in terms of overall system effectiveness and effectiveness of individual facility components, identify possible functional or safety deficiencies, prepare criteria or warrants for extending the cycle facilities system, and conceptual design treatments for integrating cycle facilities in new developments and for incorporating them

concentrated on specific Davis problems such as increasing the bike-pedestrian orientation of the downtown area and reducing bike-bike and bike-pedestrian conflicts in the central campus area.

Search terms: Bicycle lanes; Bikeway planning; Bicycle accidents; Bicycle safety; Intersections; Turning lanes; Bicycle rider age; Time of accidents; California; Traffic conflicts; Bicycle usage; Bikeways; Theft prevention

**HS-840 018 Fld. 3/3**

## **SELECTED BICYCLE SAFETY INSTRUCTIONAL METHODS AND CONTENT WITH APPLI- CATION TO THE HIGHWAY TRANSPORTATION SYSTEM**

Southern Illinois Univ., S31200

1971 104p

This student workbook presents objectives, suggested activities, commentaries, and tests on several areas of bicycle safety. Topics covered include: the highway transportation system; bicycle care and use; traffic signs, signals, and pavement markings; and traffic laws.

Search terms: Bicycle safety; Curriculum; Safety education; Instruction manuals; Bicycle handling

### **3/4 Driver Behavior**

**HS-012 236 Fld. 3/4; 2/2**

## **DRIVER INFORMATION REQUIREMENTS AND AC- CEPTANCE CRITERIA**

by J. W. Eberhard

Sponsored by Highway Research Board Special Committee on Electronic Research in the Highway Field and Committee on Traffic Control Devices and presented at Highway Research Board 48th Annual Meeting.

The purpose of this study was to analyze the route guidance information required and preferred by drivers. Required driver information was derived by determining how an unfamiliar driver negotiated a generic intersection. Driver acceptance of the Electronic Route Guidance System concept, information requirements, display characteristics, and desirability of a partially implemented system were also analyzed. The driver information requirements were verified by the public acceptance study. The public thought the system was useful and a substantial portion thought they would acquire the in-car system which they thought would cost under \$200. A route guidance display concept designed around the limitations of an aged driver and the driver information requirements was developed. The concept is based on presenting a clear and unambiguous display of the essential maneuvers required to negotiate close sequential choice points (intersections). The analysis would suggest the use of a head-up display.

Search terms: Driving task analysis; Electronic Route Guidance System; Intersections; Consumer acceptance; Display systems; Information seeking; Driver reaction time

### 3/5 Driver Education

HS-012 232 Fld. 3/5

## HOW TO DRIVE. A GUIDE FOR BEGINNING AND EXPERIENCED DRIVERS.

1972 126p

This manual, designed for beginning and experienced drivers, presents simple, concise steps on how to develop good, safe driving habits and skills in starting, stopping, parking, and operating a car. Basic information which every driver must learn is presented on traffic rules and regulations, insurance requirements, vehicle maintenance, what to do in case of an accident, and the importance of being emotionally and physically fit to drive. Information on learning to use the eyes in scanning the traffic scene; a new easy method for maintaining a safe following distance; up-to-date information on new changes in highway development and new traffic control signs, signals, and markings; how to meet emergency driving situations; and special driving skills needed for pulling a trailer are included.

Search terms: Driving tasks; Automobile handling; Traffic laws; Freeway driving; Driver emergency responses; Insurance; Vision; Preventive maintenance; Driver mental fitness; Driver physical fitness; Trailers; Instruction manuals; Automobile maintenance; Driver skills; Hazard perception; Driver responsibility after accident; Towing

HS-012 245 Fld. 3/5

## WHAT DOES DDC DO FOR THE DRIVER?

by J. Stephenson

Published in *Traffic Safety* v72 n11 p8-11, 34-5 (Nov 1972)

1972

Findings of a three year comprehensive study of the National Safety Council's Driver Improvement Program are presented.

following the course, while moving violations were cut by one quarter. Other results show drivers who completed DDC to have reduced some types of collisions by 40% or more and to have increased markedly their use of safety belts. Instances where decreases might have been less than expected were found to be related to a lack of emphasis in the instructional program. Other findings indicate that: DDC instruction was of greater benefit in reducing accidents for men than women; the amount of reduction of accident rate was about the same for drivers of all ages, with the exception of drivers under 24; participation in DDC appeared to be equally effective in reducing drivers' accidents, regardless of education.

Search terms: Defensive driving; Accident rates; Driver sex; Driver age; Driver educational levels; Traffic law violations; Accident types; Seat belt usage; Male drivers; Female drivers

HS-840 003 Fld. 3/5; 3/4

## DRIVER CONDITION AND BEHAVIOR

Illinois Univ., I14400

1971 48p refs

This publication is part of an in-service retraining program for driver education. Instructional objectives and learning activities are presented as learning experiments on the following topics: functions of the human brain and their relationship to the driving task; general physical conditions which can affect driving ability; emotions and their effect on driving proficiency; and motivations for responsible driving. Sources and teaching materials are indicated for each experimental topic. Tests and questionnaires to evaluate knowledge and attitudes are also presented.

Search terms: Driver education; Driver

HS-840 004 Fld. 3/5

## ADULT DRIVER EDUCATION REFRESHER COURSE

Illinois Univ., I14400

1971 40p

A driver education curriculum designed for the older adult driver is presented. Course objectives, topic outlines, learning activities, and a test of traffic laws and regulations are included. The curriculum places heavy emphasis on local personal task needs and practical application that is most meaningful to the participants.

Search terms: Driver education; Adult drivers; Driver education manuals; Curricula; Driver tests; Illinois; Driver skills; Driving tasks; Traffic laws

HS-840 005 Fld. 3/5; 3/9

## DRIVER EDUCATION FOR THE HANDICAPPED. VOL 1. A RE- SOURCE CURRICULUM IN DRIVER EDUCATION TEACHER PREPARATION.

Southern Illinois Univ., S31200

1971 183p

Contract SEE-35-009-71

This publication provides curriculum recommendations for the design and implementation of an effective teacher preparation course of study for driver education for the handicapped. Eleven basic curriculum units are suggested: introduction, legal implications, types of handicapped, individual evaluation of student, psychological and perceptual factors, curriculum content, role of the guidance counselor and special education teacher, driving aids, financial assistance programs, review of programs, and facilities.

Driver mental fitness; Driver physical fitness; Deaf drivers; Epilepsy; Driver education; Disability evaluation; Driver license restrictions; Illinois; Self help devices; Abnormalities; Mental retardation; Mental disorders; Vision disorders

HS-840 008 Fld. 3/5; 3/3

## A STUDY TO DETERMINE AN OPTIMUM CLOCK HOUR LABO- RATORY PROGRAM FOR MASTERY OF THE BASIC SKILLS THAT PERTAIN TO OPERATION OF MOTOR- DRIVEN CYCLES

Southern Illinois Univ., S31200

1971 45p 32refs

A course of study was developed for the sequential instruction of basic operational skills for a motor-driven cycle. An evaluative instrument was developed to determine the student's attainment of the basic operational skills. Twelve subjects without previous experience in the operation of a two-wheeled, motor-powered cycle were instructed and evaluated in terms of the amount of time necessary to master the basic operational skills. All 12 students completed the course of instruction and fulfilled all instructional objectives. The findings of this study indicate that the optimum clock hour program for the development of basic skills of operation of a motor-driven cycle is one which allows a minimum of three and one half hours if it is to accommodate the needs of all the students.

Search terms: Motorcycle operator education; Driver skills; Driver evaluation devices; Learning rates; Driver performance; Driver tests; Curricula; Motorcycle handling; Motorcycle operator experience

HS-840 009 Fld. 3/5; 3/9

Southern Illinois Univ., S31200

1971 62p refs

Contained in this publication are approximately 200 annotated entries related to the physically or mentally handicapped student including completed research, equipment resources, and other related data for the teaching of handicapped persons how to operate a motor vehicle safely and efficiently. The guide is organized on a subject basis.

Search terms: Driver mental fitness; Driver physical fitness; Handicapped drivers; Driver education; Bibliographies; Mental retardation; Mental disorders; Deaf drivers; Speech disorders; Vision disorders; Driver license restrictions; Disability evaluation; Self help devices

3/6 Driver Licensing

HS-012 235 Fld. 3/6; 3/11; 3/4

## ELDERLY PEDESTRIANS AND DRIVERS: THE PROBLEM THAT REFUSES TO GO AWAY

by E. L. Wiener

Miami Univ., Fla., M29100

1972 68p 68refs

Presented at North Carolina Symposium on Traffic Safety, Chapel Hill, 17 Oct 1972.

The elderly pedestrian runs a considerable risk of having his life ended in the street and the elderly driver encounters a task which may be in the boundary-lands of his perceptual-motor skills; he faces, as well, fear and uncertainty about how long he can maintain his driving privileges. In studying the problem of pedestrian safety, it is concluded that the

Data on driving patterns and accident involvement of aged drivers indicate that the accident record of drivers over 65 is worthy of concern; the absolute number and proportion of drivers over 65 will increase in the next few decades; and the older driver may require special scrutiny on the part of those issuing driving permits. A system of multiphase driver license examination of the elderly and an outline of computer technology necessary to implement it are presented.

Search terms: Aged pedestrians; Aged drivers; Pedestrian safety; Pedestrian fatalities; Age factor in accidents; Driver licensing; Driver license examination; Computerized driver testing; Legal rights; Injuries by age; Fatalities by age

### 3/11 Pedestrians

HS-012 234 Fld. 3/11

## THE ABILITY OF ELEMENTARY AND SECONDARY SCHOOL CHILDREN TO SENSE ONCOMING CAR VELOCITY

by S. Salvatore

Health Services and Mental Health Administration

1972 28p 13refs

Report no. ICRL-RR-71-1; DHEW-Pub(HSM)72-10015

Forty children, aged five to 14, were asked to classify as slow, medium, or fast the velocity of vehicles approaching them on a two lane rural road in a residential setting. Developmental aspects are definitely present. The older the child the more likely he is to make correct slow and medium judgements of the vehicle's velocity. However, the correct judgements of fast are inversely related to age. This puts the older child at greater risk. Sex is also a significant

the males in the sample made more correct judgements over the whole speed range. Results indicate considerable differences associated with age and sex. Vehicle associated characteristics, such as size and noise, are also shown to influence the velocity judgement.

Search terms: Velocity perception; Children; Sex factors; Age factors; Cues; Vehicle noise; Vehicle size

## AVAILABILITY: GPO

## 4/0 OTHER SAFETY-RELATED AREAS

### 4/2 Community Support

HS-012 197 Fld. 4/2; 1/3; 4/5

## DEVELOPMENT OF HIGHWAY SAFETY PROGRAM AND PROJECT EVALUATION CRITERIA: ACCIDENT EXPERIENCE CHARACTERIZATION. FINAL REPORT

by D. K. Damkot; W. T. Pollock

Michigan Univ. Hwy. Safety Res. Inst., M40800

1971 142p 2refs

Report no. HSRI-335040-2

The purpose of this study was to develop procedures for collating quantitative data on accidents, drivers, vehicles, and roads to form normalized, areal indices of Michigan's accident experience. Three types of traffic data were identified as key elements in a characterization of the state's highway safety posture: gross accident data, accident statistics normalized by number of registered vehicles, and a uniform index of traffic density between the counties. The use and relevance of the data incorporated into the county profiles are discussed

Search terms: Program evaluation; Highway safety programs; Michigan; Data acquisition; Data processing; Computerized records management; Accident location; Traffic data analysis; Accident statistics; Vehicle registration; Highway mileage; Vehicle mileage; Population; Traffic density; Forecasting; Priorities; County government; Accident statistics; Fatality statistics; Injury statistics

## 4/8 Transportation Systems

HS-012 199 Fld. 4/8

## TRANSPORTATION AND THE MENTALLY RETARDED

President's Com. on Mental Retardation, P32100

1972 61p refs

Report no. DHEW-(OS)-72-40

Contracted to Harold F. Wise and Associates.

Independent and dependent travel problems and successful training of the mentally retarded are discussed. It is recommended that modifications be made in equipment to simplify use of transportation systems and that agencies and schools provide increased training. Mechanics and modes of transportation for dependent travel are summarized. Recommendations cover modification of equipment, development of specialized systems, special training for transportation personnel, legislation, development of a coordinated center, and integration of transportation with other activities. Sources of federal, state, and local government funding are described.

Search terms: Mental retardation; Transportation of handicapped; Trans-

HS-012 203 Fld. 4/8; 4/7

## ESTIMATING AUTO OCCUPANCY: A REVIEW OF METHODOLOGY

by D. A. Morin; E. Weiner; A. Kane; P. Sawyer; J. Cruz

Federal Hwy. Administration, F06000

1972 56p 28refs

Occupancy models are used to convert automobile person trips to automobile vehicle trips for system planning and design purposes. Generally, factoring is done before trip distribution when a trip-end modal split procedure is used and after trip distribution when a trip-interchange modal split procedure is used. In either case, the use of occupancy values is necessary prior to highway traffic assignment. Four methods used in developing auto occupancy models are discussed: average factor method, curve fitting, cross classification, and regression analysis. Examples of studies that have used these methods are presented.

Search terms: Automobile occupancy; Automobile usage; Mathematical models; Land usage effect on traffic generation; Regression analysis; Factor analysis; Trip purpose; Modal split technique; Transportation planning; Trip forecasting; Travel time; Transportation studies

AVAILABILITY: GPO \$60

## 5/0 VEHICLE SAFETY

### 5/3 Cycles

HS-012 217 Fld. 5/3; 3/3; 3/11

## PEDESTRIAN AND BICYCLE SAFETY. PACIFICA

Supported by the California Office of Traf. Safety and the National Hwy. Traf. Safety Administration.

The objective of this project was to study the pedestrian and bicycle safety program and prepare ancillary information programs and procedures for implementing pedestrian and bicycle safety objectives including development of effective pedestrian and bicycle safety educational programs. Existing procedures were evaluated including an in-depth statistical analysis of bicycle rodeo results. A pilot study for a bicycle rider road test was also conducted. Overhead project or slides were prepared and 58 1/2 minutes of sound-on-slide programming were developed and recorded for use in pedestrian and bicycle safety education. Detailed recommendations for a continuing pedestrian and safety education program are presented.

Search terms: Bicycle safety; Bicycle accidents; Bicycle rider age; Bicycle licensing; Bicycle rider skill tests; Child safety education; Pedestrian safety; Pedestrian accidents; Program evaluation; Rodeos; Pacifica; Audiovisual aids; Correlation analysis; Accident causes; Age factor in accidents

### 5/4 Design

HS-012 204 Fld. 5/4; 1/3

## SMALL-ON SAFETY, THE DESIGNED-IN DANGERS OF THE VOLKSWAGEN

Center for Auto Safety, C34300

Published by Grossman Publishers, New York, \$6.95

1972 199p refs

The book concludes that the Volks-

from the windshield, the weakness of the seat tracks and seat backs, the likelihood of the doors opening in a crash, the consequent likelihood of passenger ejection, the dangerous location of the gasoline tank, the propensity of the gas cap and the gas lines to come off during a crash, steering column penetration in a frontal crash, the vulnerability of the doors to side impact intrusion, extraordinary side-wind sensitivity, and handling qualities which make the car quite unpredictable. These factors not only give the Beetle a higher propensity toward involvement in single vehicle crashes than most other cars, but also make the Beetle more likely to cause serious or fatal injury in any collision. The recommendations presented deal with the following aspects of the Volkswagen problem: size as a safety factor, responsibilities of Volkswagen, and responsibilities of NHTSA.

Search terms: Volkswagens; Crashworthiness; Automobile handling; Automobile stability; Precrash phase; Crash phase; Postcrash phase; Seat caused injuries; Seat failures; Door latch failures; Fires by vehicle make; Accident caused fires; Accident factors; Fuel system failures; Steering wheel caused injuries; Windshield caused injuries; Automobile recall campaigns; Injuries by vehicle make; Accidents by vehicle make; Oversteer; Rollover accidents; Automobile defects; Automobile repair costs; Compliance tests; Accident by vehicle size; Wind forces

HS-012 228 Fld. 5/4

## VEHICLE ESCAPEWORTHINESS AND FLAMMABILITY AS RELATED TO HIGHWAY SAFETY

by J. L. Burgess; L. L. Hoag

Presented at Human Factors Society  
15th annual meeting, New York, Oct  
1971.

Search terms: Bumper design; Energy  
absorbing bumpers; Bumper standards

absorbing front structures; Crash-  
worthy bodies; Displacement

The concept of escapeworthiness as related to motor vehicle safety is presented and explained. Accident data as related to escapeworthiness are presented, followed by a summary of the research conducted in this area. The research presented includes emergency egress from automobiles which enter the water and studies of the flammability of vehicular materials. It was found that a model could be used to evaluate the emergency egress capability for a test group of automobiles. Similar results were obtained for emergency egress from buses. Data on vehicle floating times and underwater escape problems are also presented. Finally, the flammability of vehicular materials is discussed in relation to emergency egress.

Search terms: Escape from vehicle; Flammability; Vehicle flotation time; Submerged vehicle escape; Simulation models; Vehicle fires; Postcrash phase; Escape time; Flammability tests; Automobile design; Bus design; Combustion rate; Escapeworthiness

**HS-012 246** Fld. 5/4

## **THE BUMPER CROP OF 1973**

by A. Perrow

Published in *Motor* (New York) v138 n5  
p52, 54-6, 60 (Nov 1972)

1972

Federal standards for all of Detroit's 1973 models require that a passenger car be capable of sustaining a 5 mph front, and a 2.5 mph rear, barrier collision without damage to any safety-related systems of the car. The design and operation of the new bumpers on 1973 automobiles manufactured by American

**HS-800 685** Fld. 5/4

## **BASIC RESEARCH IN CRASH- WORTHINESS 2. STRUCTURAL MODIFICATIONS OF COMPACT CARS FOR FRONTAL IMPACTS. INTERIM TECHNICAL REPORT**

by E. H. Johnson

Cornell Aeronautical Lab., Inc., C67200

1972 117p 7refs

Contract FH-11-7622

Report no. CAL-YB-2987-V-2

Concepts previously developed to improve the crashworthiness of standard size vehicles in high speed frontal impacts were studied to determine their applicability to compact cars. The Chevrolet Nova was utilized in this series of tests which consisted of one base line and three modified vehicles. The test condition for all the vehicles was a 60 mph head-on impact into a 12.75 inch diameter pole barrier. Low speed impact tests were also made. Comparisons between the modified and the base line vehicle demonstrated the major improvement in the crashworthiness ability of these vehicles. The most successful test resulted in a 50% reduction in the dynamic penetration of the pole while maintaining the deceleration values at an acceptable level. The primary imperfection of the design was that an excessive amount of weight (350-500 lbs.) was added to the vehicle. Chest and head acceleration tolerances are described.

Search terms: Crashworthiness; Safety design; Automobile modification; Compact automobiles; Pole impact tests; Vehicle weight; Unintended body construction; Chevrolets; High speed impact tests; Structural deformation

**AVAILABILITY: NTIS**

**HS-800 689** Fld. 5/4

## **EXPERIMENTAL SAFETY VEHI- CLE (FAMILY SEDAN). DESIGN, DEVELOPMENT, AND FABRICA- TION. FINAL REPORT**

American Machine and Foundry Co.,  
A33600

1972 762p refs

Contract DOT-OS-00090

Aspects of the safety car program described include: brakes; suspension and steering; wheels and tires; engine and drivetrain; rearview mirrors; vehicle lighting; field of view; windshield design; structural crashworthiness; occupant protection; electrical system; other safety features; stability and handling; impact tests; occupant acceleration tolerances; fuel cells; fuel system design; fire prevention; reliability; ride performance; bumper, frame, and door design. The results of dynamic and computerized tests are described.

Search terms: Safety cars; Experimental automobiles; Automobile safety characteristics; Automobile performance; Brake system design; Suspension systems; Steering system design; Engine design; Wheel design; Rearview mirrors; Vehicle lighting; Vehicle riding qualities; Occupant protection; Bumper design; Mathematical models; Stress analysis; Display systems; Dynamic tests; Acceleration tolerances; Computerized simulation; Automobile handling; Frame design; Control location; Automobile interior design; Structural design; Automobile design; Impact tests; Restraint system tests; Fire prevention; Electric system design; Air



**HS-800 693 Fld. 5/4**

**THE FAIRCHILD ESV FAMILY  
SEDAN. VOL. 1. FINAL REPORT**

Fairchild Hiller Corp., F01200

1972 334p Srefs  
Contract DOT-OS-00050  
Report no. EV127R0005

A comprehensive description of the experimental safety vehicle (ESV) prototype and its major subsystems is presented. Each description includes the rationale for the design and the design decisions that led to the finalization of the Fairchild ESV system. This volume also lists and summarizes the final development test reports which were submitted to DOT, and contains a list of production drawings and process specifications for documentation of the prototype and spare vehicles.

Search terms: Experimental automobiles; Safety cars; Automobile safety characteristics; Automobile design; Safety design; Crashworthy bodies; Suspension systems; Engine design; Brake system design; Vehicle lighting; Field of view; Instrument panel design; Bumper design; Energy absorbing systems; Occupant protection; Restraint system design; Door design; Seat design; Automobile interior design; Fire prevention; Pedestrian vehicle interface; Automobile tests; Performance tests; Materials tests; Vehicle weight; Automobile materials; Structural design; Body design; Fuel system design; Yaw

**AVAILABILITY: NTIS**

**HS-800 694 Fld. 5/4**

**THE FAIRCHILD ESV FAMILY  
SEDAN. VOL. 2. FINAL REPORT**

Fairchild Hiller Corp., F01200

Analytical and test data to substantiate the expected experimental safety vehicle (ESV) performance in the areas of braking, steering, handling, stability, lighting, engine, bumpers, side structures, roof, interior design, and restraint systems are presented. A description of the system dynamic models used in predicting ESV front and rear crash performance are included, as well as the structural interaction model used in the stress analysis for front and rear impact.

Search terms: Experimental automobiles; Safety cars; Performance tests; Dynamic models; Performance characteristics; Automobile performance; Automobile tests; Brake tests; Steering tests; Automobile handling; Automobile safety characteristics; Lamp standards; Energy absorbing side structures; Automobile interior design; Vehicle lighting; Design standards; Vehicle riding qualities; Test equipment; Crashworthy bodies; Stress analysis; Impact tests; Computerized test methods; Crashworthiness; Crash response forecasting; Automobile stability; Bumper design; Engine design; Restraint system design; Roofs; Mathematical models

**AVAILABILITY: NTIS**

**HS-800 695 Fld. 5/4**

**THE FAIRCHILD ESV FAMILY  
SEDAN. VOL. 3. FINAL REPORT**

Fairchild Hiller Corp., F01200

1972 99p  
Contract DOT-OS-00050  
Report no. EV127R0005

This volume contains a description of the Fairchild manufacturing operation with views of the vehicle in various stages of fabrication and assembly; and summaries of the vehicle test plans

for engineering support. Program management tasks and the quality assurance program are also summarized. Acceptance tests on the completed experimental safety vehicle are described. An operator's manual and structural welding specifications are included.

Search terms: Experimental automobiles; Automobile manufacturing; Safety cars; Automobile design; Automobile tests; Quality control; Manufacturing inspection; Performance tests; Owner manuals; Welding; Specifications

**AVAILABILITY: NTIS**

**HS-800 714 Fld. 5/4**

**REAR END STRUCTURAL  
CRASHWORTHINESS OF  
PERIMETER FRAME VEHICLES—SUMMARY REPORT**

by R. L. Anderson; E. Enserink

Dynamic Science, D36000

1972 117p  
Contract FH-11-7604;  
DOT-HS-046-2-264  
Report no. 2310-72-21

Report for Jul 1970-Jul 1972.

For abstract and search terms see HS-800 697.

**AVAILABILITY: NTIS**

**HS-800 730 Fld. 5/4; 4/5**

**INITIAL CRASH TEST SCREENING STUDIES UTILIZING THE NHTSA/BCL COMPUTER SIMULATION PROGRAM FOR COLLISION CAR/CAR AND**

This collision simulation program is capable of analyzing collinear car/car and car/fixed rigid barrier collisions in which each car may be represented by a lumped-parameter configuration involving up to 4 masses and 35 nonlinear springs. In the initial screening studies described herein, both the car/car and car/fixed barrier simulation modes were exercised to evaluate the likely acceptability/significance of several candidate full-scale crash tests aimed at demonstrating low speed-no damage rear impact performance and high-speed, front-to-rear, car/car impact performance of the ESV prototypes. Also discussed is a minor program modification which was developed to continuously monitor the kinetic energy level of the vehicle masses and the energy absorbed by the individual energy absorbing elements.

Search terms: Accident simulation; Collision models; Computerized simulation; Computer programs; Crash response forecasting; Vehicle vehicle impact tests; Barrier collision tests; Kinetic energy; Energy absorption; Equations of motion; Hydraulic bumpers; Impact forces; Rear end collisions; High speed impact tests; Experimental automobiles; Safety cars; Crashworthiness; Mathematical models; Deflection

#### AVAILABILITY: NTIS

HS-800 736 Fld. 5/4; 4/7; 1/3

#### ESCAPE WORTHINESS OF VEHICLES FOR OCCUPANCY SURVIVALS AND CRASHES. PT. 1, RESEARCH PROGRAM. FINAL REPORT

by C. M. Sliepcevich; W. D. Steen; J. L. Purswell; R. F. Krenke; J. R. Welker; T. D. Peace; R. E. Cullen; J. N. Ice; R. G. Rein, Jr.

Continues the studies initiated under contract FH-11-7303, the final report for which is available from NTIS (PB-198 772 and PB-198 773).

The results of a multidisciplinary study of the factors involved in escape of occupants from crashed vehicle environments in which the vehicle is incapacitated on land, submerged in water, or involved in fire are presented. Analytical modeling and other analytical techniques are provided for predicting escape times from passenger cars and buses, for predicting vehicle collision-submergence water-entry conditions and sinking times, and for estimating strength available for the operation of escape exits. Other techniques allow prediction of ignition times and burning rates of vehicle interior materials. A considerable amount of other data related to vehicle interior fire behavior and toxic product generation, flammable characteristics of various fabrics and interior materials, fuel modification, effectiveness of fire extinguishers, and fuel system design practices are also included.

Search terms: Escapeworthiness; Multidisciplinary teams; Escape from vehicle; Escape time; Accident analysis; Submerged vehicle escape; Vehicle fires; Vehicle flotation time; Accident survivability; Mathematical models; Forecasting; Flammability; Combustion rate; Accident caused fires; Bus tests; Fire extinguishers; Toxicity; Epidemiology; Variance analysis; Accident statistics; Postcrash phase; Vehicle design; Anthropometry; Interior design; Flammability tests; Crashworthy fuel systems; Fuel composition; Accident investigation; Combustion products

#### AVAILABILITY: NTIS

#### 5/6 Fuel Systems

by K. Ludvigsen

Published in *Ward's Auto World* v8 n11 p34-8 (Nov 1972)

1972

Although the automotive industry has attempted to delay the implementation of the 1975-76 federal automotive emission standards, General Motors and Questor Corp. recently announced the development of systems which will meet the standards. Both systems use catalysts to accelerate the oxidation and/or reduction of exhaust gases. The industry has had to turn to platinum group metals to achieve the required performance in the time available, in spite of the large adverse effect on the U.S. balance of trade which will result. Four categories of catalyst controlled systems are described: single-bed oxidizing; single-bed reducing; single-bed oxidizing and reducing; and dual bed oxidizing and reducing. GM's Triple-Mode Emission Control System is of the dual-bed oxidizing and reducing type and Questor's Reverter is of the single-bed reducing type. Oil companies are convinced that true lead-free fuels will be needed for converter-equipped cars in 1975.

Search terms: Catalytic converters; Dual bed catalyst systems; Monolithic catalysts; Reduction catalysts; Oxidation catalysts; Platinum; Exhaust emission control

HS-012 240 Fld. 5/6

#### LOW EMISSIONS FROM CONTROLLED COMBUSTION FOR AUTOMOTIVE RANKINE CYCLE ENGINES

by W. A. Compton; I. R. Shekleton; T.

Published in *Journal of The Air Pollution Control Association* v22 n9 p699-705 (Sep 1972)

1972 9refs

Presented at 64th annual meeting of Air Pollution Control Assoc., Atlantic City, Jun 1971, as paper-71-84. Based on Environmental Protection Agency contract no. EHS 70-106.

A full scale 2 million B.t.u. per hour working model of a Rankine cycle engine combustor and controls which can surpass the emission goals established for 1975-76 were developed. Special features of the combustor are the unique methods of precisely controlling both the fuel and air to provide optimum flame performance at any engine power level. The special requirements of the Rankine cycle engine are presented. Design methods that are necessary to achieve low emissions in continuous flow combustion systems are discussed. Emphasis is placed on the importance of interfacing a combustion system with other engine parts if a successful low emission, wide turndown ratio combustor working model is to be achieved. Discussion on combustion kinetics is included to advise on approaches necessary to minimize NO formation in external combustion systems while maintaining high efficiency and low CO and unburned hydrocarbons.

Search terms: Rankine cycle engines; Controlled combustion systems; Combustion chamber design; Reaction kinetics; Fuel flow; Air flow; Air fuel ratio; Fuel injection; Atomizing; Exhaust emission tests; Exhaust emission standards; Engine design; Mathematical analysis; Carbon monoxide; Nitrogen oxides; Exhaust emission control devices

by R. D. Fleming; J. R. Allsup; T. R. French; D. E. Eccleston

Published in *Journal of The Air Pollution Control Association* v22 n6 p451-8 (Jun 1972)

1972 5refs

Supported by National LP-Gas Assoc. and Environmental Protection Agency. Presented at 64th annual meeting of Air Pollution Control Assoc., Atlantic City, Jun 1971, as Paper-71-173.

The objective of the study was to evaluate propane as a low-pollution fuel and to provide information on adjustment of engine parameters for advantageous use of propane as a low-pollution fuel. Variables in the study were air-fuel ratio (A/F), ignition timing schedule, and ambient temperature. Results in this study showed that engines using propane as compared with gasoline can operate over a wide range of A/F with minimum carbon monoxide and hydrocarbon emissions. Propane and natural gas emission levels were similar. No significant difference in nitrogen oxides was found for the three fuels. In addition to favorable lean-limit characteristics, propane offers other advantages as low-pollution fuel: mixture enrichment during starting and warmup is unnecessary and an emission penalty during warmup is avoided; and the photochemical reactivity of hydrocarbon emissions from propane, although higher than those from natural gas, is lower than the reactivity of hydrocarbon emissions from gasoline.

Search terms: Propane; Air fuel ratio; Ignition timing; Ambient temperatures; Exhaust emission tests; Exhaust emissions measurement; Natural gas; Gasoline; Engine dynamometers; Chassis dynamometers; Hydrocarbons; Carbon monoxide; Nitrogen oxides;

HS-012 242 Fld. 5/6

## OXYGENATES IN EXHAUST FROM SIMPLE HYDROCARBON FUELS

by D. E. Seizinger; B. Dimitriadis

Published in *Journal of The Air Pollution Control Association* v22 n1 p47-51 (Jan 1972)

1972 6refs

Supported by Coordinating Res. Council and Air Pollution Res. Advisory Com.

The objective of this study was to identify and estimate the levels of oxygenated hydrocarbon derivatives in exhaust from simple hydrocarbon fuels. This information is expected ultimately to yield estimates of the relative levels of various classes of oxygenates in exhaust from full-boiling-range gasolines. Identification and measurement of oxygenates in exhaust from the simplified fuels were accomplished using gas chromatography in conjunction with time-of-flight mass spectrometry. The analytical procedure involved concentration of the exhaust organics, followed by a two-stage chromatographic separation of the resultant mixture of oxygenates and hydrocarbons. Identified oxygenates in exhaust from nine test fuels included saturated and unsaturated aldehydes, ketones, and alcohols, as well as ether, esters, and nitro-alkanes; analytical data on organic acids were inconclusive. Of the identified non-carbonyl oxygenates, phenols, cyclic ethers, and nitromethane appear to be relatively the most abundant.

Search terms: Exhaust emission tests; Exhaust emissions measurement; Gas chromatography; Mass spectrometry; Hydrocarbons; Oxygenates

## 5/10 Lighting Systems

HS-800 738 Fld. 5/10

### IMPROVING THE STABILITY OF HEADLAMP AIM-USER GUIDELINES. FINAL REPORT

by R. H. Hemion; R. W. Hull; D. G. Cadena

Southwest Res. Inst., S31800

1972 15p 1ref  
Contract DOT-HS-024-1-202

Headlamp aim inspection and adjustment procedures are discussed. Two misalignment conditions, dogtrack and fore-and-aft headlamp location errors, cause the longitudinal and transverse axes of the vehicle and headlight supporting structure not to match the direction in which the vehicle moves on the road. Headlamp aiming is accomplished with any one of four basic types of aiming devices: visually, by projecting the beams against a screen; viewing it in miniature in an optical viewer; photometrically; or by determining the mechanical axes of the lamp. Other inspection and adjustment practices which should be followed are: lubrication of headlamp mounting and adjusting screws; aiming of headlamp support and aim adjustment; careful use of aiming instruments.

Search terms: Headlamp aiming; Headlamp tests; Headlamp alignment; Night visibility; Alignment inspection; Inspection equipment; Inspection procedures

AVAILABILITY: NTIS

HS-800 739 Fld. 5/10

### GUIDELINES FOR IMPROVING THE STABILITY OF HEADLAMP AIM. FINAL REPORT

1972 82p 9refs  
Contract DOT-HS-024-1-202  
Report no. AR829

The safety significance of improperly aimed headlights, the mechanisms by which they develop misaim, and measures by which the generation of misaim may be avoided were studied. Surveys of headlamp conditions in states with and without vehicle inspection were made. The effect of varying degrees of misaim on the driver's ability to see roadside objects with and without opposing traffic was determined. Upward misaim of the low beams increased the level of illumination to the front targets at a greater distance, although it increased glare to opposing motorists. Downward misaim reduced glare to opposing motorists but also reduced target visibility distance. With high beams, either upward or downward misaim decreases visibility distance. Sources of headlamp misaim included: internal changes within the lamp; in-service changes in the vehicle; vehicle loading and operation; headlamp inspection and adjustment; and headlamp replacement. The most serious cause of misaim is that caused by changing the loading of the vehicle. Data are provided for predicting visibility with prototype headlamp systems.

Search terms: Headlamp aiming; Headlamp alignment; Headlamp design; Vehicle inspection; Reduced visibility; Headlamp glare; Leveling devices; Dynamic loads; Self leveling headlamps; Headlamp standards; Sight distances; Accident factors; High beamed headlamps; Low beamed headlamps; Static loads; Level controlled headlamps

AVAILABILITY: NTIS

## 5/11 Maintenance and Repairs

HS-012 247 Fld. 5/11

Published in *Motor* (New York) v138 n5 p42-6 (Nov 1972)

1972

The operation of a rotary engine is described in detail. General servicing and maintenance procedures for the Mazda's gas and oil seals, metering pump, fuel and oil filters, air cleaner, and cooling system are included.

Search terms: Rotary engines; Automobile maintenance; Engine design; Cooling systems; Air filters; Oil filters; Fuel filters; Oil seals; Fuel pumps

## 5/14 Occupant Protection

HS-012 202 Fld. 5/14

### THE BUZZER-LIGHT REMINDER SYSTEM AND SAFETY BELT USE

by L. S. Robertson; W. Haddon, Jr.

Insurance Inst. for Hwy. Safety, I36000

1972 20p 26refs

This study compares the belt use of drivers of vehicles with the buzzer-light system required in safety standards to that of drivers of vehicles without it, based on visual observation at 152 sites. Analysis of data indicates that the buzzer-light system had no statistically significant effect on the safety belt use rate in equipped vehicles compared with nonequipped vehicles operated under the same conditions. Associations between belt use and other factors noted include: driver belt use fell with vehicle age; belt use was more frequent in larger cities; sex differences in belt use were not significant; belt use was high: among drivers whose estimated age was 30-49 than among drivers under 30 or over 50; and racial differences were substantial.

Search terms: Seat belt fastening warning systems; Vehicle safety standards;

HS-012 237 Fld. 5/14

## NEW PASSIVE RESTRAINT SYSTEMS

Anonymous

Published in *Journal of Automotive Engineering* v80 n9 p30-9 (Aug 1972)

1972

This state-of-the-art study based on the 2nd International Conference on Passive Restraints presents information on industry's progress in crash energy management, air cushion systems, crash sensors, and seat belt systems.

Search terms: State of the art studies; Energy absorption; Air bag restraint systems; Impact protection; Radar; Automatic seat belts; Sensors; Ignition seat belt interlocks; Automobile safety characteristics; General Motors Corp.; Ford Motor Co.; Foreign vehicles

HS-820 226 Fld. 5/14; 4/1

## LAWS REQUIRING SEAT BELTS

National Com. on Uniform Traf. Laws and Ordinances, N14400

Published in *Traffic Laws Commentary* v1 n6 (Oct 1972)

68p refs

Contract DOT-HS-107-1-153

This commentary reviews state laws requiring motor vehicles to have seat belts in the context of comparable provisions in the Uniform Vehicle Code. It also discusses domestic and foreign laws requiring use of belts, civil court decisions on the effect of failing to use available belts, and the possible preemption of state laws by federal motor vehicle safety standards.

Search terms: Seat belt regulations;

harnesses; Uniform Vehicle Code; Seat belt legal factors; Vehicle safety standards

AVAILABILITY: GPO \$1.25

## 5/17 Safety Defect Control

HS-012 206 Fld. 5/17; 4/5

## GUIDE TO SOURCES OF INFORMATION ON AUTO DEFECTS

Center for Auto Safety, C34300

1972 18p

Sources are listed as follows: background information on auto products liability litigation; information available from NHTSA on recall campaigns, consumer complaint letters, defect investigations, federal motor vehicle safety standards, compliance tests, and multidisciplinary accident investigations; and general sources including manufacturer service bulletins, attorneys and expert witnesses, Center for Auto Safety, American Trial Lawyers Association, and the Insurance Institute for Highway Safety. Appendices include addresses and telephone numbers, NHTSA organizational chart, component classification codes, an index to investigatory case files, and bibliographies.

Search terms: Information seeking; Public availability; Automobile defects; Automobile recall campaigns; Consumer complaints; Automobile safety standards; Information systems; Manufacturers liability

AVAILABILITY:

Corporate author \$5.00

HS-012 207 Fld. 5/17

## A NADER GUIDE FOR ESTABLISHING LOCAL CONSUMER AUTO COMPLAINT ORGANIZATIONS

Published in *Regulatory Record* pE12794-801 (1 Dec 1971)

1971

Reprint of *A Guide for Establishing Public Interest Consumer Auto Complaint Organizations* by T. N. Vacar.

This report contains guidelines for starting a local auto safety research center based on the experiences of an auto complaint center located in Cleveland, Ohio. Its primary purpose is to serve as an organizing manual, which must be complemented by locally gathered information about automobile problems. The aim is a nationwide network of aggressive, student-initiated and student-run consumer advocate projects. Forms used to keep track of consumer complaints are included, as well as illustrative case studies.

Search terms: Consumer complaints; Automotive industry general attacks; Automobile defects; Automotive industry negligence; Organization manuals

HS-012 208 Fld. 5/17; 5/18

## A RECALL THAT NEVER WAS: DEFECTIVE PITMAN ARMS ON 1959 and 1960 CADILLACS

Center for Auto Safety, C34300

1972 13p

The pitman arm is a lever connecting the steering box to the tie rod ends. Pitman arm failure usually occurs at the smallest cross-section near the ball joint stud. The breakage is a result of what General Motors terms torsional fatigue. GM analyses showed that the arms which failed met all GM specifications for chemistry, hardness, and processing; thus the original design specifications for the part were seriously deficient. The

safe pitman arms free of charge, that the Dept. of Transportation force GM to reveal all the data contained in its chronic files for all its vehicles, and that the Dept. of Justice consider whether grounds exist for criminal charges, against GM personnel who participated in concealing serious safety defect information from the government.

Search terms: Steering system design; Steering system failures; Cadillacs; Automobile defects; Automotive industry negligence; Fatigue (materials); Failure caused accidents; Automobile recall campaigns

**AVAILABILITY:**  
Corporate author \$5.00

## 5/20 Trucks and Trailers

HS-012 205 Fld. 5/20; 5/14; 1/3

### SNOWMOBILES AND SNOW- MOBS. A CRITICAL LOOK AT A NEW INDUSTRY

by A. Delibert

Center for Auto Safety, C34300

n.d. 64p 113refs

Design features and types of injuries from accidents are reviewed. Safety standards for lighting, occupant protection, design, and noise exposure are proposed. Ecological damage and the need for stronger laws to control the snowmobile are discussed.

Search terms: Snowmobiles; Snowmobile accidents; Snowmobile design; Snowmobile caused injuries; Vehicle noise; Environmental impact statements; Land usage; Vehicle safety standards; Injury severity; Safety standards costs; Vehicle lighting; Reflective materials; Automotive industry general attacks; Occupant

vehicles; Loss of control caused accidents

**AVAILABILITY:**  
Corporate author \$10.00

HS-012 233 Fld. 5/20; 1/3

### SAFETY ASPECTS OF RECREA- TIONAL VEHICLES. SPECIAL STUDY

National Transp. Safety Board, N30000

1972 38p  
Report no. NTSB-HSS-72-2

The study explores available data surrounding the hazards attending an explosive growth in the use of recreational vehicles. The potential hazards attending each type of vehicle and its use are considered, and the reality of these problems is illustrated qualitatively by relating many of them to accidents which have actually happened and in which many of these safety issues have appeared. The study recommends that the National Highway Traffic Safety Administration obtain and study the data necessary to verify the nature and extent of these problems, provide new vehicle classifications, extend many motor vehicle safety standards to vehicles not now included, and conduct a pilot program aimed at making available adequate consumer information and safety guides for the purchases and users of recreational vehicles. The U.S. Department of the Interior is urged to establish suitable controls, in cooperation with their state counterparts, governing the entry by motor vehicles into certain wilderness, forestry, mountain, or desert areas.

Search terms: Recreational vehicles; Vehicle safety standards; Vehicle classification; Off the road vehicles; Accident case reports; Snowmobile accidents; Environmental factors; Driver

systems; Campers (truck mounted); Travel trailers; Vehicle stability; Mobile homes

## 5/22 Wheel Systems

HS-012 198 Fld. 5/22

### TIRE INFLATION AND THE CONSUMER

National Business Council for Consumer Affairs, N10250

1972 19p 8refs

This report examines the importance of correct tire inflation pressures to consumer automobile safety, economy, and ride quality. Current research findings on passenger car tire inflation and tire pressure supplied by gas station air towers are reviewed. The report concludes with the following recommendations: corporations involved in the sale, servicing, and use of passenger car tires should increase efforts to educate consumers on the importance of proper tire inflation; and the federal government should initiate and coordinate a continuing program to assure accurate readings on fixed air pressure measurement devices used in service stations and other business locations to inflate passenger car tires.

Search terms: Tire inflation pressure; Federal role; Consumer education; Corporate responsibility; Tire safety; Tire wear; Tire inflation pressure gauges; Air pumps

**AVAILABILITY:** GPO \$.40

HS-012 227 Fld. 5/22

### RECENT DEVELOPMENTS IN USE OF INFRARED FOR NON- DESTRUCTIVE TIRE TESTING

HS-012 227 (Cont'd.)

Department of Transp., D17400

1972? 11p 5refs

Tires often fail as a result of friction generated heat buildup in a localized area. Therefore, investigators need to monitor this buildup not only for design purposes but to stop a test before the tire is completely destroyed thus rendering failure analysis extremely difficult. Three categories of instruments are currently being used by the Department of Transportation and industry for examining tires: transient phenomena radiometers, steady state radiation thermometers, and imaging systems. Each is described, examples of readouts are given, and their relative merits are discussed. A parametric comparison is made.

Search terms: Tire temperature; Tire test equipment; Sensors; Infrared scanning; Scanning; Tire tests; Thermometers; Nondestructive tests; Thermal stresses

HS-012 229 Fld. 5/22

**A LABORATORY SCALE MODEL TECHNIQUE FOR INVESTIGATING PNEUMATIC TIRE HYDROPLANING. INTERIM REPORT**

by H. Dugoff; I. R. Ehrlich

Stevens Inst. of Tech., S43800

1967 42p 10refs  
Contract NSR-31-003-016  
Report no. R-1223

A new technique is developed for laboratory investigation of pneumatic tire

modified aircraft landing-gear assembly which permits freedom in heave under variable vertical load and allows measurement of the longitudinal force exerted on the tire. The treadmill is capable of speeds up to 90 feet per second and is outfitted with a water supply system and a nozzle which delivers a water layer one foot wide, of variable thickness, at matching speed. Model tires fabricated of polyurethane foam have been shown to exhibit static load-deflection characteristics which accurately simulate the properties of full-scale pneumatic aircraft tires. Dimensional analysis has been employed to derive additional requirements for dynamic similarity and to develop a design for the initial series of experiments.

Search terms: Hydroplaning; Pneumatic tires; Static tests; Tire force measurement; Scale models; Tire deflection; Dimensional analysis; Tire test equipment; Measuring instruments; Equations; Polyurethane foams; Aircraft tires; Model tests; Tire prints; Simulation models; Tire loads; Tire shape; Laboratory tests

HS-012 230 Fld. 5/22; 1/3; 4/3

**A SECOND STUDY OF RELATIONSHIPS BETWEEN TIRE TREAD DEPTH AND THE LIKELIHOOD OF ACCIDENT INVOLVEMENT**

Highway Safety Foundation, H09800

1972 38p 3refs

In cooperation with Ohio State Highway Patrol.

This study was undertaken to validate and refine the findings of an earlier effort. Tire tread depth measurements were collected for a sample of vehicles involved in traffic accidents at the time of moving traffic violation. A second

ments for both samples were computed by comparison with the distribution of tire tread depths found in the population at large. The proportion of abnormal accident occurrence was found inversely related to tire tread depth. An analysis was performed to determine that legal minimum tire tread depth below which motorists were apt to incur more costs in abnormal accident involvement than could be saved by postponing the purchase of new tires. The desired legal minimum tread depth was found to be 4/32 inch.

Search terms: Tire tread depths; Accident causes; Tire standards; Traffic law violations; Benefit cost analysis; Accident factors; Accident costs; Tire replacement costs; Tire safety; Tire wear measurement

HS-012 231 Fld. 5/22; 4/7

**PARAMETERS AFFECTING MODEL-TIRE HYDROPLANING AND ROLLING RESTORATION**

by I. R. Ehrlich; A. R. Schaefer; G. A. Wray

Stevens Inst. of Tech., S43800

1970 56p 6refs  
Contract NSR-31-003-016; NAS-1-9349  
Report no. SIT-DL-70-1405; R-1405

The results of a comprehensive parametric model-study of smooth tires operating on a smooth surface are presented. Hydroplaning inception (spin-down) and rolling restoration (spin-up) are discussed. Conclusions indicate that hydroplaning inception occurs at a speed which is usually greater than twice that at which rolling restoration occurs. Hydroplaning speed increases with increased footprint pressure; it increases but slightly with decreasing water-film depth. Although hydroplaning speed varies with tire width and loading, the

Search terms: Hydroplaning; Aircraft tires; Speed; Critical velocity; Tire test equipment; Water depth; Aspect ratio; Tire inflation pressure; Tire road contact forces; Tire loads; Parameters; Tire prints; Mathematical analysis; Tire diameters; Laboratory tests

Department of Transp. Systems  
Center, D17500

1971 53p 3refs  
Report no. DOT-TSC-NHTSA-71-5

The status of several promising methods for nondestructive tire inspection is surveyed with the conclusion that radiographic, infrared, holographic, and ultrasonic techniques warrant further evaluation. Of the testing methods investigated, only X ray technology is sufficiently advanced for immediate consideration as an inspection tool. A program plan is outlined to correlate non-destructive tire inspection data to tire failure data. The emphasis is on inspection systems having sufficient resolution

and discrimination capability to detect a broad range of anomalies. Failed tires will be analyzed to determine those anomalies that lead to tire failure and eventually to provide a capability for failure prediction based upon non-destructive inspection techniques.

Search terms: Nondestructive tests; Tire inspection; X ray analysis; Infrared analyzers; Radiography; Holographic interferometry; Resonance; Ultrasonic tests; Acoustic measurement; Microwaves; Scanners; Tire failures; Tire defects; Tire materials; Tire test equipment; Tire temperature tests; Tire force measurement; Laboratory tests

**AVAILABILITY: NHTSA**

**HS-820 205 Fld. 5/22**

# **SURVEY OF NON-DESTRUCTIVE TIRE INSPECTION TECHNIQUES. PRELIMINARY MEMORANDUM**

by A. L. Lavery; I. Litant; R. P. Ryan;  
N. Knable; H. L. Ceccon

\*U.S. GOVERNMENT PRINTING OFFICE 513004

## **SPECIAL NOTICE**

The Highway Safety Literature file is available for computer searches by the highway safety community. Citations contained in the file cover the period 1967 through 1972; all are unclassified and unlimited. Although there are certain outdated and incomplete data in the older citations, every effort is being made to eliminate or update them. To use the HSL system, searchers must have a 2780 compatible terminal on "dial-up" telephone service. For further information, contact:

Director  
Office of Administrative Services (N48-50)  
National Highway Traffic Safety  
Administration  
400 7th Street, S. W.  
Washington, D. C. 20590



**DOT-HS-018-3-597**

**COMPUTERIZED PRODUCTION  
OF OSE REPORTS**

Control Systems Research, Inc.  
1515 Wilson Boulevard  
Arlington, Virginia 22209

12 Jan 73 to 12 Jul 73

\$28,697

The purpose of this contract is to accomplish computerized production of the Office of Standards Enforcement reports. This requires a detailed analysis of the current reporting procedures, systems design, computer program development, data base development, demonstration, and documentation with the OSE.

**DOT-HS-031-3-589**

**AUTOMATION AND UTILIZA-  
TION OF MULTIDISCIPLINARY  
ACCIDENT INVESTIGATION  
REPORTS**

The Regents of the University of Michigan  
Ann Arbor, Michigan 48105

1 Jan 73 to 1 Jan 74

\$133,950

The contractor shall continue automation of Multidisciplinary Accident Investigation reports, improve case quality, document editing criteria and reference information, develop an accident causation coding scheme, enhance data file utilization, provide technical consultation and systems design, provide capability for data transfer at the Government's option, build special files to relate bi-level and MDAI files, develop and implement new variables as specified.

**DOT-HS-305-3-579**

**IMPLEMENTATION AND  
OPERATION OF FATALITY  
ANALYSIS FILE**

Commonwealth of Massachusetts  
Governor's Highway Safety Bureau  
146 Bowdoin Street  
Boston, Massachusetts 02108

1 Jan 73 to 1 Jan 74

\$20,500

The objective of this effort is to establish a research oriented file of highway fatalities in support of the Alcohol Counter-

measures Program. The contractor shall forward manually encoded cases of fatalities, accidents and update previous records on a monthly basis. Data sources specified are: official enforcement officer's traffic accident report, driver history file, death certificates, coroner's report, hospital records, health department records.

**DOT-HS-312-3-598**

**IMPLEMENTATION AND  
OPERATION OF FATALITY  
ANALYSIS FILE**

State of Nevada  
Department of Motor Vehicles  
555 Wright Way,  
Carson City, Nevada 89701

1 Jan 73 to 1 Jan 74

\$4,257

The objective of this effort is to establish a research oriented file of highway fatalities in support of the Alcohol Countermeasures Program. The contractor shall forward manually encoded cases of fatalities, accidents and update previous records on a monthly basis. Data sources specified are: official enforcement officer's traffic accident report, driver history file, death certificates, coroner's reports, hospital records, health department records.

**U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**

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